

Biological Terrorism: Past Lessons and Future Outlook



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Two critical security challenges are permanent fixtures of history. The first stems from Mother Nature's disasters, including earthquakes, floods, and infectious diseases. The second are man-made threats, such as crimes, terrorism, and war. Summarizing these dual calamities, Revelations (6:8) aptly observed: "To him was given the right to kill by the sword and famine, by pestilence, and wild beasts."

Since this report focuses on the dangers biological terrorism pose to individuals, communities, nations, and, indeed, perhaps even to the survival of civilization itself, it behooves humanity to beware of the nature and security implications of this potential challenge. Thus, some of the historical insights and lessons should be noted, particularly those related to the *modus operandi*, of both the strong and the weak actors who have deployed a wide range of weapons, from primitive to high tech, in the struggle for power within and among societies.

Suffice to mention Homer's observation more than three thousand years ago: "The blade itself incites to violence" (The Odyssey, XVI). It is not surprising, therefore, that this primitive weapon and other tools that project psychological intimidation and physical power were utilized from "above" by state actors and from "below" by ethnic, racial, religious, tribal, and political entities as well as by "lone wolves" beginning in antiquity to the modern era.

Thus, between the 11th and 13th centuries, the Hashashin (assassins), descendants of the Ismailis, systematically utilized daggers and swords in their martyrdom missions, targeting their Sunni adversaries and Crusaders in Persia and elsewhere in the Middle East. Although their battles lasted some two hundred years, their historical experience serves as a warning that "low-level" or "low-intensity" forms of man-made violence can be attractive, cost-effective, and ultimately successful even if the available weapons are rather primitive.

To be sure, over subsequent centuries numerous internal and external conflicts have demonstrated an evolutionary development of arms, such as guns, explosives, and more sophisticated arsenals of escalated violent capabilities. An insightful glimpse of this alarming reality was predicted by the military philosopher Antoine-Henri Jomini in the 19th century who asserted that "the means of destruction are approaching perfection with frightful rapidity."¹ This assessment was brutally realized in the 20th and 21st centuries during which biological, chemical, and nuclear weapons were deployed.

In this connection, two keen contemporary observations spring to mind. First is the view of General Matthew B. Ridgway (USA) that was delivered at a speech in Cleveland on November 10, 1953, saying: "There is still one absolute weapon...That weapon is man himself."² Second is the concern expressed by Justice Arthur J. Goldberg (former

¹ Baron Antoine-Henri Jomini. *The Art of War*, translated by Capt. G.H. Mendell and Lt. W.P. Craighill. Philadelphia: J.B Lippincott & Co., 1862, p. 48.

² Cited in *Dictionary of Military and Naval Quotations*. Annapolis, MD: U.S. Naval Institute, 1966, p. 358.

U.S. Supreme Court justice and U.S. ambassador to the United Nations). In 1976, he wrote “Indeed modern terrorism, with sophisticated technological means at its disposal and the future possibility of access to biological and nuclear weapons, presents a clear and present danger to the very existence of civilization itself.”³

Undoubtedly, there is a need to focus on the biological threats posed to society, whether occurring naturally or exacerbated or engineered by other actors. The following segment of the “Introduction” to this report on “Biological Terrorism: Past Lessons and Future Outlook” provides only a brief context of biological terrorism challenges.⁴ Some academic efforts in this field, such as projects, seminars, and publications are intended to serve as general background of our work. An acknowledgement section is also incorporated.

Biological Agents Challenges

The open source literature related to WMD is endless. Before discussing the biological challenges, a brief consideration of both chemical and nuclear threats are in order. Chemical attacks include nerve agents (e.g. VX, sarin, and tabun), sulfur mustards, hydrogen cyanide, and chlorine. For instance, in March 1995, the first major use of chemical weapons by terrorists were recorded when members of the Japanese radical cult Aum Shinrikyo placed containers of the deadly nerve gas sarin on five trains of the Tokyo subway system. The perpetrators then punctured the containers and released poisonous gas into the trains and subway systems. While the attack resulted in the death of 12 persons, 5,500 others were injured.

Also, in the post-9/11 era, both al-Qa’ida and Daesh (the so-called Islamic State) have developed some capability to employ chemical weapons against their adversaries. For example, it has been reported by the media that British police foiled an al-Qa’ida plot to release cyanide gas in the London underground. And more recently, Daesh has used chemical weapons, such as chlorine and sulfur mustard agents, in multiple attacks in Iraq and Syria since its emergence in the region in 2014.⁵

And clearly the nuclear terrorist threat has traditionally represented the most frightening weapon ever created. That specter includes the explosion of the ultimate bomb, the use of fissionable material as a radioactive poison, the seizure and sabotage of nuclear facilities, and a “dirty bomb” attack (a radiological dispersal device that combines conventional explosives).

Aside from the foregoing chemical and nuclear dangers, a quick guide of biological challenges from natural causes to man-made involves a broad-range of characteristics. These include, for instance, viruses (e.g. Yellow fever, smallpox, Ebola), bacteria (e.g.

³ “Foreword” to Yonah Alexander, ed. *International Terrorism: National, Regional, and Global Perspectives*. New York and London: Praeger Publishers, 1976.

⁴ The data and analysis provided by this “Introduction” is based on past and current published and unpublished research efforts by Yonah Alexander for the past half-century. Additional sources are listed in selected footnotes and the preliminary bibliography.

⁵ Schmitt, Eric. “ISIS Used Chemical Arms at Least 52 Times in Syria and Iraq, Report Says.” *The New York Times*, November 21, 2016. <https://www.nytimes.com/2016/11/21/world/middleeast/isis-chemical-weapons-syria-iraq-mosul.html?ref=middleeast&r=0>

plague, tularemia, anthrax, cholera), toxins (e.g. ricin, botulism), and rickettsia (e.g. Q fever, typhus).

The above list of agents selected at random is considered capable of spreading disease among humans, animals, or plants. Disease develops when people and animals are exposed to infectious microorganisms or to chemicals which are produced by such organisms. After an incubation period, during which organisms are multiplied, the disease may even cause death. Mention should also be made of a number of fungal pathogens, such as smut of wheat, that is capable of destroying crops as well as resulting in famine and other costly diseases.

Despite these types of classification of biological challenges, the historical and contemporary records provide extensive evidence regarding the nature, intensity, and health security implications of existing threats. These massive data sources also serve as a warning to beware of future catastrophic losses to human lives and economic costs to those societies affected by biological pathogen attacks.

For example, in the 14th century, the Black Plague wiped out 30-60 percent of Europe's population. Likewise, nearly a century ago, the 1918 influenza pandemic, regarded as the deadliest in modern times, killed an estimated 50-100 million people worldwide. And the Asia flu, originated in China in 1957-1958, cost between one to four million lives.

More recently, the deadly Ebola outbreak presented a major health security challenge nationally, regionally, and globally. The deadly disease that began in 2014 has created unprecedented fear and anxiety over public safety, not only in parts of West Africa but the virus also seriously impacted the United States, Europe, and elsewhere. By the time the epidemic ended, some 28,000 Ebola cases were reported resulting in some 11,315 deaths.⁶

Currently, an ongoing health security is the Zika virus infection that is spread by mosquitos (that are also the vectors of many other diseases), sexually, and through blood transfusion as well as laboratory exposure. The disease causes microcephaly and many other birth defects. Another grave humanitarian concern is the cholera epidemic that is expanding in war-torn Yemen where more than 100,000 cases were already recorded by WHO sources, a quarter of them children.⁷ This disease is caused by bacteria from water or food contaminated with feces.

In sum, the globalization of pandemic outbreaks of deadly infectious diseases are only a matter of time. The Centers for Disease Control and Prevention recently reported that during the 2015-2017 period, it has already "monitored more than 300 outbreaks in 160 countries, tracking 37 dangerous pathogens in 2016 alone."⁸

⁶ "Ebola Situation Report - 30 March 2016." *World Health Organization*, 30 March 2016.

<http://apps.who.int/ebola/current-situation/ebola-situation-report-30-march-2016>

⁷ Miles, Tom. "Yemen cholera cases pass the 100,000 mark: WHO." *Reuters*, 8 June 2017.

<http://www.reuters.com/article/us-yemen-cholera-idUSKBN18Z17N>

⁸ Sun, Lena H. "The Trump administration is ill-prepared for a global pandemic." *The Washington Post*, 8 April 2017. https://www.washingtonpost.com/national/health-science/the-trump-administration-is-ill-prepared-for-a-global-pandemic/2017/04/08/59605bc6-1a49-11e7-9887-1a5314b56a08_story.html?utm_term=.de38cbc09f2a

In light of this growing challenge, Bill Gates warned in a February 2017 Security Conference in Munich that “by the work of nature or the hands of a terrorist,’... an outbreak could kill tens of millions in the near future unless governments begin ‘to prepare for these epidemics the same way we prepare for war.’”⁹

Biological Weapons: A Poor Terrorist’s “Nuclear” Bomb?

Aside from Mother Nature’s diseases, another health security concern stems from biological weapons deployed by both state and non-state individuals and groups. Again, both historical and contemporary experience amply demonstrates that there are no limits to the evil intentions of perpetrators during war and peace periods.

Suffice to mention the 1346 case when bodies of Tartar soldiers who died of the Plague (a bacterial infection) were thrown over the walls of the city of Kaffa (currently located in Crimea) targeting the local residents. Similarly, English forces in 1767 used blankets contaminated with smallpox virus spread the disease among the native population during the French Indian War.

It was not, however, until World War I when chemical weapons (e.g. chlorine and mustard gases) were deployed by Germany causing 1.3 million casualties and 100,000 deaths that the international community subsequently began to consider some legal and diplomatic measures aiming to bring the challenge under manageable levels. Thus, in June 1925, the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare was signed in Geneva. Also, in April 1972, the Biological Weapons Convention (BWC) was opened for signature and three years later the BWC entered into force and by 2016 a total of 178 states are party to the treaty.¹⁰

Another noteworthy step was undertaken by the United Nations following the Gulf War. In April 1991, Security Council Resolution 687 established a Special Commission (UNSCOM) to eliminate WMD in Iraq, where the regime had developed a biological program that included the spread of typhoid, cholera, and anthrax. While concerns over current and future secret biological weapons programs of states such as Iran, Syria, and North Korea still exist, many countries are also continuing defensive research and development activities.

Aside from such potential dangers, biological terrorism also stems from individuals and groups throughout the world. Among the proven biological incidents triggered by terrorists are the following cases selected at random:

⁹ Selk, Avi. “Bill Gates: Bioterrorism could kill more than nuclear war — but no one is ready to deal with it.” *The Washington Post*, February 18, 2017.

https://www.washingtonpost.com/news/worldviews/wp/2017/02/18/bill-gates-bioterrorism-could-kill-more-than-nuclear-war-but-no-one-is-ready-to-deal-with-it/?utm_term=.6c9640e5bec6

¹⁰ “Membership of the Biological Weapons Convention.” The United Nations Office at Geneva.

[http://www.unog.ch/80256EE600585943/\(httpPages\)/7BE6CBBEA0477B52C12571860035FD5C](http://www.unog.ch/80256EE600585943/(httpPages)/7BE6CBBEA0477B52C12571860035FD5C)

- In 1972, members of the Order of the Rising Sun (a neo-Nazi group) attempted to acquire an agent that causes typhus. They possessed 30-40 kilograms of bacteria for use on water supplies in major Midwest cities.
- A factory for making *Clostridium botulinum* culture was discovered at a hideout of the German Red Army Faction in Paris in 1980.
- The Animal Liberation Front in 1984 claimed to have contaminated Mars candy bars in the UK with rat poison.
- In 1986, salmonella was used by the Rajneesh religious cult in Oregon to contaminate salad bars in restaurants, resulting in 750 cases of food poisoning.
- Following the 9/11 attacks, anthrax letters were sent to various targets, including Senators Thomas Daschle and Patrick Leahy. 18 cases were confirmed and 5 people died.
- Al-Qa'ida terror network attempted to produce ricin, conducted tests on animals, and recruited operatives to conduct biological attacks (e.g. 2011 scheme to poison water at a tourist site in Spain).
- And in January 2016, Daesh planned to contaminate Turkish water sources with biological agents (e.g. *Francisella tularensis*, which causes tularemia or rabbit fever).

Although this partial record demonstrates a limited utilization of biological weapons by terrorists, it is possible that certain geopolitical conciliations could provide perpetrators with incentives to escalate their attacks dramatically. “Just imagine what might happen in the aftermath of the anticipated collapse of Daesh (also known as ISIS, ISIL, Islamic State) in Iraq and subsequently in Syria. Daesh leadership has promised to regain ‘lost areas,’ and its fighters and supporters are orchestrating their deadly attacks in dozens of countries in the Middle East and beyond, including the United States. Since the self-declared ‘Islamic Caliphate’ represents a territorial vision without borders, Daesh is likely to resort, without compunction, to a broad range of biological weapons in battles for regional and global dominance.”¹¹

Facing these and other potential biological threats, the U.S. government is spending billions annually to address the challenge. Thus far at least, the Federal efforts are incomprehensive and fragmented. Other countries have also expressed concerns on the looming dangers. Thus, “the United Kingdom [has warned] that Daesh might weaponize Ebola, Germany hosted an international symposium on protection against biological warfare agents, Italy engaged its scientific community to deal with biological defense, and France performed a nationwide drill to prepare for biological attacks.”¹²

In sum, to prevent a potential “Black Plague”-like disaster, it behooves all nations to recall the warning in Shakespeare’s *King Lear*, “We make guilty of our disasters the sun, the moon, and stars: as if we were villains on necessity; fools by heavenly compulsion...” (Act 1, Scene 2).

¹¹ Alexander, Yonah and Milton Hoenig. “Can we prevent ISIS’s Doomsday Revenge?” *The Times of Israel*, December 21, 2016. <http://www.timesofisrael.com/can-we-prevent-isis-doomsday-revenge/>

¹² Ibid.

Academic Context

The emergence in the post-World War II era of the “Age of Terrorism,” coupled with the concerning escalation into a potential “Age of Super Terrorism” with all its frightening implications has generated infinite diversified published and unpublished literature by governmental, inter-governmental, and non-governmental bodies. The purpose of this section is merely to outline selected academic programs relevant to biological terrorism issues that were undertaken by the Inter-University Center for Terrorism Studies, the Inter-University Center for Legal Studies, and the International Center for Terrorism Studies, and their earlier institutional structures during the past half-a-century. These activities consisted of seminars and publications seeking to provide insights into historical lessons learned, future potential threats, and offer recommendations for counter biological terrorism strategies by public and private entities.

To be sure, many of the various academic initiatives focused attention on the broader WMD challenges because of the linkages between biological, chemical, and nuclear challenges in terms of threats and responses.

Many of the seminars organized over the years in the United States and abroad have dealt with topics such as “Future Trends of Terrorism,” “Mass Destruction Attacks,” “Technology and Terrorism,” “Preventing Super Terrorism,” and “International Cooperation Against WMD.” Other seminars focused on both “chemical and biological weapons” as well as specifically on “biological terrorism.”

Several related WMD academic projects and publications are noteworthy. One project was developed by the “Task Force on the Prevention of Nuclear Terrorism,” co-sponsored by the Institute for Studies in International Terrorism (ISIT) at the State University of New York and the Nuclear Control Institute (NCI) in Washington D.C. That effort resulted in the publication of two books: *Nuclear Terrorism: Defining the Threat* (Pergamon-Brassey’s, 1986) and *Preventing Nuclear Terrorism* (Lexington Books, 1987). Both volumes were co-edited by Paul Leventhal and Yonah Alexander.

A second academic effort in this field was the 1988 formation of an international multidisciplinary project on “Preventing Super-Terrorism,” administered by Professor Yonah Alexander, Director of the Inter-University Center for Terrorism Studies (IUCTS) at The George Washington University, and Professor Yuval Ne’eman, the Wolfson Distinguished Chair in Theoretical Physics at Tel Aviv University. The purpose of this project, chaired by Professor Edward Teller of Lawrence Livermore Research Laboratory and Stanford University, was to both develop coherent counter-proliferation policies and increase governmental and public understanding of the risks of and responses to super-terrorism without providing sensitive information that could prove useful to potential perpetrators of terrorist acts involving weapons of mass destruction. An international task force of experts representing various disciplines and nationalities was responsible for formulating a critical analysis of the dimensions of the challenge and for developing a strategy to cope with it.

A third academic activity was the 2012 undertaking of a research project on a “WMD-Free Zone in the Middle East” (WMDFFZME). This ongoing effort is administered

by the IUCTS in cooperation with the International Center for Terrorism Studies (ICTS) at the Potomac Institute for Policy Studies (PIPS) in Arlington, Virginia, and the Inter-University Center for Legal Studies (IUCLS) at the International Law Institute (ILI) in Washington, D.C. The objective of this project is to organize a series of seminars and to conduct research with experts from both the public and the private sectors seeking to offer recommendations for ultimately achieving a Middle East free of WMD.

A more recent major academic initiative is the establishment of the bipartisan Blue Ribbon Study Panel on Biodefense co-chaired by Senator Joseph Lieberman (Former United States Senator and Attorney General of the State of Connecticut; the Democratic Vice-Presidential candidate in 2000; and currently Senior Counsel at Kasowitz, Benson, Torres, & Friedman LLP and Co-Chair of the Blue Ribbon Study Panel on Biodefense) and Governor Thomas Ridge (First Assistant to the President for Homeland Security, first Secretary of the U.S. Department of Homeland Security, former Governor of Pennsylvania, and currently Chairman of Ridge Global and Co-Chair of the Blue Ribbon Study Panel on Biodefense) and with panel members former Secretary of Health and Human Services Donna Shalala, former Senator Majority Leader Tom Daschle, former Representative Jim Greenwood, and the Honorable Kenneth Wainstein. Established in 2014 with the institutional sponsorship of the Hudson Institute and the IUCTS and subsequently with the Potomac Institute for Policy Studies too, the Panel assesses the spectrum of biodefense efforts from preparation to recovery and is developing recommendations for the U.S. government to improve and optimize these efforts. It has already published two reports "A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts" (October 2015)¹³ and "Biodefense Indicators: One Year Later, Events Outpacing Federal Efforts to Defend the Nation" (December 2016).¹⁴

To be sure, other studies resulted from more extensive academic projects. These contributions appeared in publications such as *Terrorism: An International Journal* (Taylor and Francis, 1988-1991); *Terrorism: An International Resource File, 1970-1990* (University Microfilm International, 1988-1991); *Technology Against Terrorism: Structuring Security* (Office of Technology Assessment, U.S. Congress, 1992); and *Super-Terrorism: Biological, Chemical, Nuclear* (Transnational Publishers, 2002), co-edited by Yonah Alexander and Milton Hoenig.

Some of the most focused publications on biological terrorism were initiated by PIPS and the IUCTS over two decades ago. A major book on *Countering Biological Terrorism in the U.S.: An Understanding of Issues and Status* co-edited by David W. Siegrist and Janice M. Graham was released by Oceana Publications, Inc. in 1999 as a special volume included in *Terrorism: Documents of International and Local Control* (edited by Yonah Alexander and Donald J. Musch).

Additionally, a special report titled "The Age of Super and Cyber Terrorism: Selected Papers" was published in summer 1999 by PIPS in conjunction with a

¹³ The 2015 report on "A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts" (October 2015) can be viewed at <https://www.iucts.org/publications/reports/blue-ribbon-report-on-biodefense/>

¹⁴ The 2016 report on "Biodefense Indicators: One Year Later, Events Outpacing Federal Efforts to Defend the Nation" can be viewed at <https://www.iucts.org/publications/reports/blue-ribbon-report-biodefense-indicators/>

research project on “Counter Terrorism Strategies in the 21st Century: National, Regional, and Global Agenda” undertaken by the IUCTS and the IUCLS. Two of the presentations included in this study, namely, by the then Secretary of the Navy Richard Danzig and Professor Matthew Meselson of Harvard University are reprinted in this current report on “Biological Terrorism: Past Lessons and Future Outlook.”

Mention should be made of two other recent relevant reports. One is on “Reassessing the WMD Challenges: The Next Phase?” (May 2014) with the participation of Charles A. Duelfer (Former Special Advisor to the Director of Central Intelligence for Iraq, WMD; leader of the Iraq Survey Group on WMD; and acting Chairman of the UN Special Commission on Iraq (UNSCOM); currently, Chairman of the Board, OMNIS, Inc.); Greg Gross (Former Deputy Assistant Secretary of Defense and senior staff member, U.S. Senate; currently, consultant on foreign policy and military affairs); Michael Eisenstadt (Senior Fellow and Director, Military and Security Studies Program, The Washington Institute for Near East Policy); and Dr. Milton Hoenig (Nuclear physicist and coauthor with Professor Yonah Alexander of *The New Iranian Leadership: Ahmadinejad, Terrorism, Nuclear Ambition, and the Middle East* (Praeger Security International) and *Super Terrorism: Biological, Chemical, and Nuclear* (Transnational Publishers)).

The second report on “Latin America’s Strategic Outlook: Populist Politics, Health Concerns, and Other Security Challenges” (April 2017) focused *inter alia* on biological terrorism. Among the contributors to this report are Professor Gary Simon (Director, Division of Infectious Diseases, Medical Faculty Associates, The George Washington University); Professor S. Gerald Sandler (Professor of Medicine and Pathology at Georgetown University Medical Center and Medical Director of the Blood Transfusion Service, MedStar Georgetown University Hospital, Washington, DC); Dr. Asha M. George (Co-Director of the Blue Ribbon Study Panel on Biodefense); and Dr. Tara Kirk Sell (member of the USA national swim team for eight years; served as captain for six national teams, and earned a silver medal at the 2004 Olympics in Athens. Currently, an associate at the Center for Health Security at the University of Pittsburgh Medical Center).

Finally, the purpose of the current report on “Biological Terrorism: Past Lessons and Future Outlook” is to include a number of presentations delivered at past and recent seminars. The contributors include the Honorable Richard Danzig (Secretary of the Navy) and Professor Matthew Meselson (Harvard University) who participated at luncheon seminars in 1999 that focused on the threat of biological terrorism as well as Governor Thomas J. Ridge and Senator Joseph I. Lieberman (both co-chairs of the Blue Ribbon Study Panel on Biodefense) who spoke at an event on “International Cooperation in Combating Terrorism: Review of 2015 and Outlook for 2016” held on February 8, 2016, at the National Press Club.

Additional contributors to this report include Professor Rita Colwell (Distinguished University Professor at the University of Maryland, College Park and the Johns Hopkins University Bloomberg School of Public Health, and Senior Fellow at Potomac Institute for Policy Studies) and the Honorable Tevi Troy, PhD (CEO, American Health Policy Institute. Former Deputy Secretary, U.S. Department of Health and Human Services. Author, *Shall We Wake the President? Two Centuries of Disaster Management from the Oval Office*) who both participated at an event on “Preventing WMD Terrorism:

Past Lessons and Future Outlook” held on March 23, 2017, at the Potomac Institute for Policy Studies are also included in this publication.

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Finally, the views expressed in this report do not necessarily reflect those of the institutions associated with our academic work.

June 12, 2017

The Honorable Richard Danzig

Secretary of the Navy*

What I'd like to do is to talk about two different things and connect them in terms of their implications. One is what I've called the NEW weapons. I've done what I think is fundamental to any possible success in the Pentagon world, which is to make up a new acronym. Clearly, you can develop a program from an acronym and build a platform there. My new acronym, in a failure of imagination, is NEW, for non-explosive weapons.

I'd like to talk a little bit about what this transition from a technology we're so familiar with in all-warfare applications, ever since the Chinese invention of gunpowder 650 years ago, has meant. We've unconsciously built our military systems and our defenses against terrorism around the notion of explosive technology and warfare. But the transition from that to non-explosive weaponry, biological warfare, information warfare, the use of environmental factors like radiation and chemical warfare – what does that change mean and require of us? I think one can generalize about it in ways that people have tended not to do because it crosses so many different areas. I don't think they have thought enough about the underlying commonalities and the kinds of demands it places upon us.

The second thing is something that interests you all a great deal as well and it travels frequently under the name of concerns about terrorism. I'm calling it, for reasons that I'll get into in a little bit, traumatic attacks, and the vision that, in fact, our opponents may seek to inflict trauma on us. Military and security issues are not simply, or, perhaps even in the 21st Century prominently, acts of the exercise of some power of control over an opponent that leads to the evisceration of the opponent's military machine or the occupation of territory. They are rather a battle of wills, and military activities are simply one domain in which those battles of wills occur. The efforts to inflict trauma is an effort to erode the will of the population receiving that trauma, thereby to change the nature of the struggle.

The Tofflers raised a stimulating and basically sound and interesting point in their book *War and Anti-War*. The Tofflers earlier created the third-wave theory, arguing that we have seen a transition from an agricultural society, that being the first wave, to an industrial society, that being the second, to an information age as the third wave. In *War and Anti-War* they argued that in the context of warfare we replicate the general economic relationships of society as a whole. In the agricultural age we fought for an agricultural goal – it was territory. We fought with agricultural means – human labor, animal labor, that sort of thing. The measure of power in 1880, to some degree, was horses. Really, we made a transition into an industrial world and that industrial world clearly was different, and it evolved with the industrial revolution.

* Note: This presentation on May 12, 1999, was part of a series of luncheon seminars that featured presentations by the country's senior leadership on critical issues surrounding the increasing threat of biological terrorism. The seminar series was sponsored in part by the Defense Sciences Office of the Defense Advance Research Projects Agency, and in part by the Potomac Institute for Policy Studies in cooperation with the Inter-University Center for Terrorism Studies and the Inter-University Center for Legal Studies.

This presentation was originally published in a report on "The Age of Super and Cyber Terrorism: Selected Papers" (1999), pp. 3-9.

It focused on production as economically good, and in the military context it focused on the opposite of production, which was destruction, physical destruction. It used industrial mechanisms – the combustion engine, the classic in this regard, to achieve those kinds of ends. The Tofflers' argument is that in the information age, a lot of what is involved is battles of perceptions. If you look at what's happening in Serbia now, or what happened in Iraq in recent years, you see that a lot of leverage in the issues is about how we persuade our opponents that we have a stronger will or that we can keep a coalition together. There are struggles over how all of this appears to the world. So one of Milosevic's first efforts is to exclude all foreign journalists and reintroduce particular controlled circumstances.

In Iraq one of the major issues I found, as Secretary of the Navy, when I went out and visited the Fifth Fleet, was, and is, whether Saddam can shoot down an American airplane and capture the flyer. Well, we all accept that as just a given of the issues, and one of the incredibly great achievements of the military in the wake of Desert Storm is that we have flown over two-hundred thousand sorties over Iraq without losing a pilot. Two hundred thousand sorties – an incredible notion. I would expect more accidents flying two hundred thousand sorties over the United States than we've experienced in the context of Iraq. But it's worth stopping and thinking about why is this so relevant.

It is not a military triumph to shoot down a single airplane, capture a single pilot. But, in fact, we're dealing with battles over will. So I would suggest that the notions of warfare have evolved. In fact, traumatic attack, which I will define as efforts to try and inflict injury upon a civilian population, and thereby erode the sense of confidence of that population in its government and their will to continue to wage war, seems to be more likely a phenomenon in the future.

Now if I've set up two paradigms here – the NEW warfare and traumatic attack – let me say a little bit about each, connect them with each other, and then see if I can suggest some operational implications.

NEW warfare – non-explosive weaponry. What are the characteristics of these weapons as against explosive weapons?

One of the first that immediately comes to mind that has powerful implications is that mass is not as relevant to non-explosive weapons as it is to explosive weaponry. In fact, you can argue that it's virtually irrelevant or, indeed, counterproductive. If I, on the offense with explosive weaponry, generate large amounts of equipment and machines and platform, I expand my power to influence my opponent. But we know that a millionth of a gram of Anthrax can kill and that a kilogram, more or less, could kill hundreds of thousands of people. I don't need mass to project power.

In the information realm, I don't need super computers to introduce viruses, or to hack or create duplicity and misleading data. Many of the instances that we've looked at of information attacks involve people working with PCs or barely a step up from that. I think of the notorious case in England, where an individual hacker acquired so much information that he vastly outstripped his PC's ability to contain it. he just

parked his information in a file on one of our computers unknown to us. You do not need mass to attack with NEW weaponry.

In fact, also equally significantly, mass doesn't help you in defense. Give me more troops and I defend against explosive weaponry more powerfully. Give me more troops in the face of a biological attack and I have a bigger problem because I have more casualties, more questions of people I need to protect and the like. Similarly in the information context, mass doesn't help me; it renders me more vulnerable. Mass isn't useful in a traditional sense. I can't build walls that protect me against biological attacks and I don't build walls in cyberspace. So here is a first proposition of a very fundamental change.

A second and related proposition is platforms do not need to be nearly so significant in non-explosive warfare. In fact, platforms are not required in extravagant proportions. I can launch my attack from the personal computer... Give me a biological incident and the desire to perpetrate one – I can hire a crop duster airplane, as we did in one experiment in the 1960s, and fly it down the Mississippi and cover the whole central part of the United States. With one crop duster airplane I can give you even more casualties than occurred in any one month in World War II. If that seems too sophisticated, I can take my biological material and put it in the filters of the World Trade Center, or go to the roof at night, since we know biologicals have more staying power at night than they do during the day, and disperse them around New York City. I don't need any platform at all, except the one the World Trade Center naturally provides.

A major third consequence flows from these two things: the fact that I don't need mass to attack and I don't need platforms. I don't need to be a major industrial nation to wage these forms of warfare. Second- and third-tier opponents can do this. The Iraqis of the world, however minimized in their capability to conduct traditional explosive warfare, can retain substantial capability for biological warfare. In fact, so can terrorist groups – Aum Shinrikyo – and so can even individuals.

Anybody who thinks that biological issues are being played up beyond their proportion – because nobody would want to do this and the like, and no sane nation would do it – needs to address a simple question that I've been putting forward for a few years, which is, "Suppose the Unabomber had been a biologist, not a mathematician?" It seems to me evident that the kinds of skills required to develop this weaponry are not super-sophisticated, and the numbers of people to build it can, in fact, be limited to individuals. That brings me to a fourth characteristic of the NEW weaponry, which is that it doesn't require great expense and it doesn't require sophistication, and a fifth characteristic, it links to a high degree with now widely prevalent civilian technologies.

This is not even as sophisticated as building nuclear weaponry and the like. This is the kind of work that people with a reasonable education, below the Ph.D. level, can master. Think about your hackers, think about your biologists who have essentially college-level biological skills. Again, it underscores the point that you don't have to be an industrial nation, or even a nation at all, to make use of this kind of activity. The very youth of hackers underscores all this. I talked to the JASONS recently about these things and one of them raised the fact that there was a biological incident, which

turned out to be nothing more elaborate than somebody having taken a kid into a swimming pool with the diaper not clean. What a concern it was when dirty diapers can generate these kinds of things. My observation was what really concerns me is that the hackers are virtually in diapers and generate for us many of these kinds of problems.

Another characteristic of these activities is that the industries are not merely civilian and dispersed, but also that they are extraordinarily fast-moving organizations. The evolution of the information age and the evolution of biological work come at extraordinary speeds, as compared to the relative stability and production cycles, both offensive and defensive, associated with traditional explosive warfare. We are truly dealing with a different age in terms of the morphing of the weaponry we're concerned with and the speed of the introduction of change, either in genomic research or in building computer software and the like. We are also seeing strong internationalization of these skills, with almost no ability, because they are information-based, to control them through normal things like export controls and the like. A very great difficulty.

Finally I'll just add one more, though I could go on with the list. One that I particularly want to flag is the confluence between the natural occurrences that we confront and the circumstances of attack that we might experience in a national security context, and the line between these natural circumstances and the military attack circumstances, an in-between territory which I'll call crime. Biological incidents occur all the time. The diaper incident I mentioned is obviously exemplary of a small thing.

I gave a talk at a conference Sid Drell ran at Stanford and I got up at the end of the dinner speech – I talk at any meal. The expectations being richly primed in that audience, just having had a three-day conference on biological warfare, I proceeded to give them a scenario for a biological horror story. I set it in a year which I called Year 18, and described our mobilizing against an opponent, like we did in Desert Storm, and a biological incident, a virus, breaking out in one of our mobilization camps among the reservists and increasing numbers of people getting sick. Then the incident dies out. Then it recurs again, both among our troops abroad and at home, and large numbers of people die. I pointed out that at the same time we acquired evidence of interest in germ warfare by our opponent and, in the end, some 20 million people died worldwide from this biological incident. I began to pose questions associated with whether we'd use nuclear weaponry in that circumstance against the state that we were aware developed germ warfare, whipping the audience as best I could into fits of passion with regard to this. I then revealed that the Year 18 that I was talking about was 1918. That what I had just described, absent the nuclear weapons, is exactly what happened with the influenza epidemic. That a conglomeration of troops is particularly prone to illness. That in fact, it's extremely difficult to decide whether you're dealing with a natural incident or biological attack.

These things don't usually come equipped with a clear pronouncement and, in fact, we know that in 1918 German agents were arrested in the U.S. for attempting to introduce illness into horses designated for military use – and here we are working with biological warfare. So there are extremely great problems of boundary here.

You see, as well, natural incidents occurring in the world of information. We see how criminals are using both biological and information warfare. In fact, the FBI has made a substantial number of biological-related arrests. In the beginning we kept it quieter to avoid the copycat phenomenon, but that number is rising. The information hacking by criminal elements is a well-known phenomenon, which banks and others are grappling with.

So the boundaries between ordinary civilian life and natural incidents, between criminality and warfare, boundaries that have a certain crispness when we're dealing with APCs or warships going somewhere and doing something, tend not to be so clear in the NEW warfare. Part of our problem will be determining what has actually happened and why.

This connects with the traumatic attack notion. It seems to me that the NEW weapons are tailored-made, unfortunately, coincidentally, for traumatic attacks. Weapons that we so commonly call weapons of mass destruction like those used in biological warfare and information warfare really can be better perceived as weapons of mass disruption. They really disrupt the flow of mobilization and things like that, or disrupt the underlying character of the civilian society and create tumult that drains energy and drains support away from policies.

I talked some with the people who were involved in planning the responses to biological warfare that Saddam might have used in the context of Desert Storm. I asked those people in DOD what they were thinking about and how this might have been used. I thought Scooter Libby generated the best of the insights about this when he said, "I think if I were Saddam I would have taken the bombing of the bunker and the hitting of the civilian target by our air campaign and I would have said, I'm okay for a fair fight on the battlefield, but what you're doing in your air campaign is to bomb civilians. And that, to me, is unacceptable. What I'm going to do is... I'd like to do nothing, but if you continue your bombing campaign I have positioned agents outside three U.S. cities with biological weapons. I will use them unless and until you agree to stop bombing civilians and stop your air campaign."

In my view, if Saddam, Milosevic, or whoever were to do something like that, we would have a very substantial problem associated with the complexities of that kind of situation. But you can argue that nuclear deterrence, etc., would prevent him from doing that or we could use it effectively in that context. Without going too far into the intricacies of the argument I'll take you a small variable – Milosevic or Saddam and I say that there is a terrorist group in the United States, that is sympathetic to me and my aims. They have told me that they intend to use biological weapons if the air campaign goes on. I don't approve of this. I'm going to give you, the U.S., all the information here, because I refuse to engage in this barbaric form of warfare. Unfortunately, there isn't much of this information available.

What I'm going to do is, having passed it to you in those contexts, to step back. Then the terrorist group sends, let's say, a viable sample of anthrax to the White House and says that, under these circumstances, they intended to attack a U.S. city. Next they send it to a newspaper and announce what the city is – Denver.

My view is the effects are enormously disruptive without their doing anything at all. Those disruptive effects achieve substantial ends and are in the end not likely to be cause for us to be able to use nuclear deterrence as an effective tool. Which brings me to a very fundamental overarching point, as I move into the question about our defenses with regard to this and our management of these kinds of risks.

At square one, deterrence is not, I think, an extremely effective tool across the spectrum if you accept that we are not able to use deterrence as effectively on terrorists groups and individuals. Deterrence is not, whatever its virtues might be with respect to Iraq or other countries, a phenomenally effective way of controlling the Unabomber. Anything in between gets into mixed cases. It seems to me that we need to rely in these areas on a mixture of mechanisms of defensive quality, of disruptive effect, and of consequence management. The defenses, you've heard some things about – DARPA is doing some terrific work in this arena. I've been very supportive of this work and was involved in the beginning in trying to encourage them in these areas.

We can do a lot with respect to inoculations, stockpiles of antibiotics, and development of detection kinds of capabilities. We can make intelligence investments that give us much better insight about what's happening, and these yield, I think, substantial rewards.

My view though is that you cannot defend against these in ways that are absolute. You cannot give yourself a high degree of assurance that these types of events won't occur. I think, you cannot deter them. Our vulnerabilities simply outrun our capabilities for defense in these regards. Our need for information, for example, and our dependence on information networks in growing faster than our abilities to defend those networks. Our exposure to biological risk is, in my view, larger than our ability to cover that exposure.

I think disruption is an extremely effective and important technique for us in these regards, and I think we're practicing it in some ways, but I don't think we've really articulated it to ourselves. I think we really need, in effect, a paradigm here developed as richly as the paradigm of deterrence was developed in the context of explosive warfare as a way to deter nation states. What I mean by disruption is essentially – we have the ability to not completely thwart, but to make it much harder for individuals and for terrorist groups to go out and undertake these kinds of activities. The techniques for doing that are extremely varied and should, in my view, be used and orchestrated across a broad spectrum.

For example, I don't view the inspection regime against Saddam as a method of catching Saddam's biological activities in ways that will be enormously effective. We didn't generate, from the inspection, great new insights about Saddam's program or prevent him from a development effort. We know that retrospectively from the kinds of information we got, through for example, the defection of his son-in-law.

But it is a very effective disruption mechanism, even though we never articulated the fact. That is to say it forces him to move his materials around, to spend large amounts of time and effort covering over what he's doing, to, in fact, incur much greater expense and uncertainty, and not to be able to test whether his weaponization

has been successful. That's a very substantial achievement. Similarly, our efforts at, for example, bombing the factory in the Sudan – put aside whether it was a well-chosen target or not – are not going to prevent chemical or biological weaponry being developed, but it represents as a targeting policy an effort to disrupt these kinds of efforts.

Immigration checks at the border, periodic checks of samples and the like, are not going to prevent smuggling of biological weapons into this country. Think, if you doubt it for a moment, about the drug war. Norm Augustine once pointed out whimsically, but powerfully, when someone in a conversation said, "How are you going to smuggle the biological agents into the country?"—Mr. Augustine said, "We'll just put it under the marijuana." I thought it was an extremely perceptive comment.

But there is actually an analogy between the drug war and our war on biological attackers, and I think it's a rather powerful one. It is that we cannot prevent this, but we can make it harder. By making it harder we raise the price of these kinds of efforts and do indeed diminish our risk. In my view, it's a right kind of strategy.

Similarly, within the United States I think we need substantial attention to disruptive techniques against criminal elements and against security risks. I think it needs to attain to the civil liberties kinds of issues; I probably would not put it under CINC for that reason, amongst others, but it doesn't mean that we can't invest in these regards and attend to it. Disruption is a very important strategy.

The other really important strategy here is consequence management. When we started this some five years ago it was a largely under-utilized term and it was difficult to get an audience for this context. I think it is more and more appreciated. Consequence management is difficult for the military to accept as a mode of operation because it assumes a successful attack to begin with. By and large, it deals with things the military doesn't find very attractive – cleanup, damage mitigation after an event, that sort of thing.

You have an area, biological warfare, which to begin with, is alien to the military. "What is this – you're talking about threats that have a Latin name, this can't be a real kind of thing." You're dealing with a community of biologists that haven't substantially interacted with DOD – we're very familiar with the chemists and the physicists we understand the electronics issues, but the biological kinds of issues are new and different and awkward. Now on top of it, we're into a world where we're talking about homeland defense – an uncomfortable arena for the military – and an arena in which we're dealing with all kinds of civilian agencies. Think what's involved in biological issues – you have all thought of it – FEMA, Centers for Disease Control, Public Health Service – what are these entities and what do they have to do with us? We've tended to think of the NEW warfare kinds of areas as essentially support areas – information, biologics – these are for doctors and logisticians. These aren't the things of warfare... But I'm suggesting they are, in fact, the things of warfare. Weaving together a consequence management set of activities that invests in the cooperation between civilian agencies and military agencies, and creating standby kinds of capabilities to minimize the effects of what it is that we're worried about, is a very rich area of investment. But it's also very challenging for DOD and these civilian agencies to try to effect.

But the rewards are, in my view, extremely high, and I'll signal two of them. One is in avoiding the incentives toward copycatting. If the effects of a first incident, which I regard as largely unstoppable, are dramatic – sooner or later there's going to be an incident – and the destabilizing effects, in terms of people's psychologies, are extraordinary, then I think there will be strong incentives for people to replicate them.

But if the effects of the first incident reinforce some degree of confidence in the government, we do a relatively good job of managing mass hysteria, of having antibiotics available for people, of detecting this fairly early, of orchestrating the bureaucratic responses, of handling the public perceptual issues, I think we're going to substantially diminish the second order replications of this in the future, in terms of their frequency. Therefore, for me, consequence management is an extremely important means of prevention of future attacks. That's the first point.

The second point is, remember the proposition I advanced earlier, that the NEW weapons have the characteristic, that they overlap in their military use with circumstances that are natural or criminal. This is for me a very strong argument for investment in consequence management. If I were up here arguing for investment in civil defense against nuclear attack, one of the very legitimate objections would be, this is a sterile investment – building me bomb shelters might be useful in some nuclear circumstances, but it does me no good in the ordinary circumstance. But in this area, these investments can be structured so they yield high rewards against natural occurrence. That's a very rich reward. What it means is that I can get great benefit here and build constituencies and exercise those constituencies – in their cooperation in dealing with these kinds of things in the normal course of events.

I value that a lot. Remember my example about the Year 18 influenza epidemic – a natural event. Josh Lederberg was involved with this issue a decade before I got involved. His greatest concern is another influenza epidemic. Viruses mutate regularly; we're familiar with these cycles, we know we're ripe for another occurrence; we don't have really markedly better defenses against viruses now. We don't have drugs to deal with them in pronouncedly better ways than we had in 1918. Argument – if we can detect influenza kinds of situations earlier, if we can isolate people, we can diminish the kinds of effects here. Providing antibiotic treatment, etc., against opportunistic infections that come alongside these viruses can save a lot of lives. We can be better prepared for this. In the information context we have all kinds of problems that we ought to be dealing with quite apart from some hostile nation or terrorist kind of attack.

The Year 2000 gives an example of the kind of natural information problems that we encounter and have organized to deal with. We can apply what we've learned in that arena and the investments we've made towards this NEW warfare. So I would suggest, in conclusion, for me non-explosive warfare, NEW warfare, is, in fact, a different mode. It requires a change in the way we think about things. It requires changes as sweeping as the way in which we think about mass, the kinds of instruments we bring for our protection. It breaks down distinctions between home and abroad. Notice how, in fact, it didn't appear in the context of this talk. It also requires different modes of thought than our traditional deterrent-based ways of thinking with respect to the manner in which we respond.

NEW warfare presents challenges for us in working with civilian agencies across boundaries that we haven't previously worked across. It yields benefits in arenas we're not accustomed to trumpeting as an area of benefit. In my view, if traumatic attack is more and more the problem of the 21st Century, NEW weapons are more and more the vehicle for doing it. We need to make these kinds of investments not only in what we do, but also most fundamentally, in changing the way we think.

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Every major technology – metallurgy, explosives, internal combustion, aviation, electronics, nuclear energy – has been intensively exploited not only for peaceful purposes but also for hostile ones. Must this also happen with biotechnology – certain to be a dominant technology of the coming century?

Such inevitability is assumed in “The Coming Explosion of Silent Weapons” by Commander Steven Rose (*Naval War College Review*, Summer 1989), an arresting article that won essay awards from the U.S. Joint Chiefs of Staff and the Naval War College:

The outlook for biological weapons is grimly interesting. Weaponers have only just begun to explore the potential of the biotechnological revolution. It is sobering to realize that far more development lies ahead than behind.

If this prediction is correct, biotechnology will profoundly alter the nature of weaponry and the context within which it is employed. During World War II and the cold war, the United States and the Soviet Union developed and field-tested biological weapons designed to attack people and food crops over vast areas. During the century ahead, as our ability to modify fundamental life processes continues its rapid advance, we will be able not only to devise additional ways to destroy life, but will also be able to manipulate it – including the processes of cognition, development, reproduction, and inheritance.

The world in which these capabilities are widely employed for hostile purposes would be a world in which the very nature of conflict had radically changed. Therein could lie unprecedented opportunities for violence, coercion, repression, or subjugation. Movement towards such a world would distort the accelerating revolution in biotechnology in ways that would vitiate its vast beneficial application and could have inimical consequences for the course of civilization.

Is this what we are in for? Is Commander Rose right? Or will the factors that have prevented the use of biological weapons thus far survive into the coming age of biotechnology? After all, despite the fact that the technology of devastating biological weapons has existed for decades, their only use in war appears to have been that by the Imperial Japanese Army in Manchuria, more than half a century ago.

* Note: Remarks delivered at the Potomac Institute for Policy Studies on April 26, 1999. This presentation was part of a series of luncheon seminars that featured presentations by the country’s senior leadership on critical issues surrounding the increasing threat of biological terrorism. The seminar series was sponsored in part by the Defense Sciences Office of the Defense Advance Research Projects Agency, and in part by the Potomac Institute for Policy Studies in cooperation with the Inter-University Center for Terrorism Studies and the Inter-University Center for Legal Studies. This presentation was originally published in a report on “The Age of Super and Cyber Terrorism: Selected Papers” (1999), pp. 15-19.

The longstanding norm against any use of biological weapons serves not only to constrain the actions of the majority who are influenced by it, but also to enhance the deterrence of any who may be disposed to flaunt it. Whether and under what circumstances Iraq would have used the biological weapons it was attempting to develop before its Gulf War defeat in 1991 is unknown. But if Iraq had done so, the very fact of violating such a basic and longstanding norm of international behavior would have widely been seen as justification for drastic reprisal.

A similar history of restraint can be traced for chemical weapons. Although massively used in World War I and stockpiled in great quantity during World War II and the cold war, chemical weapons – despite the hundreds of wars, insurgencies, and terrorist confrontations since their last large-scale employment 80 years ago – have seldom been used since. Their use in Ethiopia, China, Yemen, and Vietnam (if one includes harassing agents), and against Iranian soldiers and Kurdish towns are among the very few exceptions. Indications that trichothecene mycotoxins had been used in Laos and Cambodia in the 1970s and 1980s proved to be illusory.

Instead of the wave of chemical and biological terrorism some feared would follow the lethal Sarin gas attacks perpetrated by the Aum Shinrikyo Cult in Japan in 1994 and 1995, there has been only a sudden epidemic of “biohoaxes” and several relatively minor “biocrimes,” undoubtedly stimulated by recent official and media attention to the potential for CBW terrorism. Two years after the Aum attack in the Tokyo subway, the FBI Section Chief for Domestic Terrorism told the Congress that “our investigations in the United States reveal no intelligence that state sponsors of terrorism, international terrorist groups, or domestic terrorist groups are currently planning to use these deadly weapons in the United States.”

Whenever the reasons – and several have been put forward – the use of disease and poison as weapons has been extremely limited, despite the great number of wars and bitter insurgencies that have occurred since the underlying technologies of the weapons became accessible. Human beings have exhibited a propensity for the use, even the veneration, of weapons that bludgeon, blast, or cut, but have generally shunned and reviled weapons that employ disease and poison. We may therefore ask if, contrary to the history of other major technologies, the hostile exploitation of biotechnology can be averted.

The factor that compels our attention to this question is the possibility that any major turn to the use of biotechnology for hostile purposes could have consequences qualitatively very different from those that have followed from the hostile exploitation of earlier technologies. Unlike the technologies of conventional or even nuclear weapons, biotechnology has the potential to place mass destructive capability in a multitude of hands and, in coming decades, to reach deeply into what we are and how we regard ourselves. It should be evident that any intensive exploitation of biotechnology for hostile purposes could take humanity down a particularly undesirable path.

Whether this happens is likely to depend not so much on the activities of lone misanthropes, hate groups, cults, or even rogue governments as on the policies and practices of the world's leading states.

In the United States, there was abrupt and remarkable change – from nearly thirty years of being deeply engaged in the development and production of biological weapons to the dramatic and unconditional U.S. renunciation of biological weapons declared by President Nixon in November 1969 and the U.S. renunciation of toxins three months later. Today the former offensive biological weapons program of the United States and the logic behind its abolition are largely forgotten, although there are valuable lessons to be learned from both.

During World War II, research, development, and pilot-scale production of biological weapons was centered at Fort (then Camp) Detrick, in Maryland. Large-scale production was planned to take place at a plant near Terre Haute, Indiana, built in 1944 for the production of anthrax and the filling of the anthrax bombs. Equipped with twelve 20,000-gallon fermentors, it was capable of producing fill for 500,000 British-designed four-pound anthrax bombs a month. Although the United Kingdom had placed an order for anthrax bombs in 1944 and the plant was ready for weapons production by the following summer, the war ended without anthrax having actually been produced.

Contrary to the view that biological weapons are easy to develop, by the end of the war Fort Detrick comprised some 250 buildings and employed approximately 3,400 people, some engaged in defensive work but many in the development and pilot production of weapons. Several years after the end of the war, the Indiana plant was demilitarized and leased to industry for production of antibiotics. It was replaced by a more modern and flexible biological weapons production facility constructed at Pine Bluff Arsenal, in Arkansas, which began production late in 1954 and operated until 1969.

A major effort of the 1950s was encompassed under Project St. Jo, a program to develop, test, produce, and deploy anthrax bombs to Europe for possible use against Soviet cities. In order to determine quantitative munitions requirements, 173 releases of non-infectious aerosols were secretly conducted in Minneapolis, St. Louis, and Winnipeg – cities chosen to have the approximate range of conditions as regards climatology, urban and industrial development, and topographic features that would be encountered in the major potential target cities of the U.S.S.R. The weapons to be used were the E133 cluster bomb, holding 536 biological bomblets, each containing 35 milliliters of a liquid suspension of anthrax spores and a small explosive charge fused to detonate upon impact with the ground, thereby producing an infectious aerosol to be inhaled by persons downwind. In later years anthrax was abandoned as a standardized U.S. lethal biological agent and replaced with a lethal strain of tularemia, a much less persistent and more predictable agent. Other agents – the bacteria of brucellosis, the rickettsia of Q fever, and the virus of Venezuelan Equine Encephalomyelitis, all more incapacitating than lethal, as well as fungi for the destruction of rice and wheat crops – were also introduced into the U.S. bioweapons

stockpile, along with improved munitions for high-altitude delivery and spray tanks for delivery of agent by low-flying aircraft. According to recent published accounts, these developments culminated in a major series of biological weapons field tests using various animals as targets, conducted at sea in the South Pacific in 1968.

After Richard Nixon became President, he ordered a comprehensive review of U.S. biological weapons programs and policies – which had been unexamined and unanalyzed by policy makers for fifteen years. Each relevant government department and agency was instructed to consider a range of options and to present its own evaluation. In November 1969, the President announced that the United States would unilaterally and unconditionally renounce biological weapons. The U.S. stockpiles were destroyed and the facilities for developing and producing them were dismantled or converted to peaceful uses. U.S. biological programs were ordered confined to defensive purposes – strictly defined. President Nixon also declared that, after nearly 50 years of U.S. recalcitrance, he would seek ratification of the 1925 Geneva Protocol, prohibiting the use in war of chemical and biological weapons. He also announced U.S. support for an international treaty proposed by the United Kingdom, banning the development, production, and possession of biological weapons, leading to the Biological Weapons Convention of 1972.

It is important to note that these U.S. decisions went far beyond the mere cancellation of a program. They renounced, without prior conditions, even the options to have biological and toxin weapons. What was the underlying logic?

First, it had become evident through the results of our own biological weapons program that deliverable biological weapons could be produced that would kill people, livestock, and crops over large areas.

Second, it was realized that our biological weapons program was pioneering a technology that, although by no means easy to create, could be duplicated with relative ease, making it possible for a large number of states to acquire the ability to threaten or carry out destruction on a level that could otherwise be matched by only a few major powers. Our biological weapons program therefore risked creating additional threats to ourselves with no compensating benefit, and was undermining prospects for combating the proliferation of biological weapons.

The clear policy implication was that we should convincingly renounce biological weapons and seek to strengthen international barriers to their development and acquisition. The U.S. renunciation of biological weapons was seen as a major step away from a universal menace. As President Nixon expressed it in November 1970, “Mankind already carries in its own hands too many of the seeds of its own destruction.”

The 1972 Biological Weapons Convention (BWC) entered into force in 1975. It is the first worldwide treaty to prohibit an entire class of weapons. The BWC now has some 140 states parties, with the most important holdouts in the Middle East. Unlike the Chemical Weapons Convention (CWC) of 1993, it has no organization, no budget,

no inspection provisions, and no sanctions – only a pledge by states never to “develop, produce, stockpile or otherwise acquire or retain” biological agents or toxins “of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes” or “weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.”

While the United States renounced biological weapons and abided by the BWC, the Soviet Union did not. According to recent statements by officials of the former Soviet program, it was believed that the U.S. renunciation of biological weapons was a hoax, intended to hide a secret offensive program. Aware of the major U.S. investment in biological weapons during the cold war and of the dynamic U.S. lead in microbiology and biochemistry, the Soviet Union continued its preparations to be able to employ biological weapons on a large scale.

An example is the facility built for the production of anthrax bombs in the early 1980s at Stepnogorsk in what is now the independent Republic of Kazakhstan. Recently dismantled under the U.S. Cooperative Threat Reduction Program in cooperation with Kazakhstan, it was equipped with ten 20,000-liter fermentors, apparatus for the large-scale, drying and milling of the agent to a fine powder, machines for filling it into bombs, and underground facilities for storage of the filled munitions. According to its cold war director, Stepnogorsk conducted numerous developments and test runs but never produced a stockpile of anthrax weapons. Nevertheless, there is no doubt that its purpose was to provide a capability to commence production on short notice if ordered to do so.

According to the Russian Federation’s 1992 declaration of past biological weapons activities, presented to the United Nations under the voluntary confidence-building agreement among States Parties to the BWC, work on the mass production and dispersion of biological agents was done at Sverdlovsk (now Ekaterinburg), Zagorsk (now Sergiyev Posad), and Kirov between the mid 1960s and 1975. At the Sverdlovsk facility, an accidental release of anthrax in April 1979 is known to have killed nearly 70 people downwind and to have killed sheep in villages out to a distance of 50 kilometers.

Field testing of aircraft and missile delivery systems for biological agents was conducted on Vozrozhdeniye Island in the Aral Sea. In a 1998 interview with a Moscow newspaper, the general in charge of Russian biological defense is quoted as saying that activities at the test site in the 1970s and 1980s were “in direct violation of the anti-biological treaty.”

The former Soviet facilities at Ekaterinburg, Sergiyev Posad, and Kirov remain closed to foreigners. U.S.-Russian-British discussions that had achieved agreement on the principle of reciprocal visits to each other’s military biological facilities as a means of resolving ambiguities have foundered and are in abeyance. Continuing suspicions, together with the general deterioration in U.S.-Russian relations, hamper joint efforts to avert a long-term threat to both. While it was the two cold war superpowers that did

most to bring biological weapons into existence, only the United States, under Nixon, fully understood that its best interest was in credible renunciation.

At present, we appear to be approaching a crossroads – a time that will test whether biotechnology, like all major predecessor technologies, will come to be intensively exploited for hostile purposes or whether instead our species will find the collective wisdom to take a different course. An essential requirement is international agreement that biological and chemical weapons are categorically prohibited. With the BWC and the CWC both in force for a majority of states, including all the major powers – and despite the importance of expanding the membership of both treaties still further – the international norms are unambiguously established.

During its first two and a half years of operation, the CWC with its staff of approximately 200 trained inspectors conducted some 350 inspections of declared chemical weapons-related facilities and sites and certain industrial facilities – including inspections of 34 chemical weapons storage sites holding some 8,000,000 chemical munitions slated for internationally verified destruction, mainly in the United States and the Russian Federation.

What can international treaties like the CWC accomplish? First, they define an agreed norm, without which arms limitation cannot succeed. Second, they act to keep compliant states compliant when they are under pressure to encroach at the limits, potentially eroding the overall norm. Third, their procedures for declaration and on-site monitoring and inspection pose the threat of exposing noncompliance and cover-up, creating a disincentive for potential violators. In particular, exposure by an international treaty organization makes it politically more difficult for compliant states to ignore violations and more likely they will take measures to terminate them and punish the violators.

In Geneva, negotiations are underway to strengthen the BWC. There is broad agreement that there should be mandatory declarations and on-site measures, administered by a standing organization. The United Kingdom and some other European states favor the adoption of declaration and inspection procedures similar to those in operation under the CWC, while others, including the United States, have so far argued for less rigorous measures.

The prohibitions embodied in the BWC and the CWC are directed to the actions of states, not individuals. Recently, interest has developed in the possibility of a convention to create international law that would hold individuals criminally responsible for acts that are prohibited to states by the biological and chemical weapons conventions. Such a convention, which would be patterned on existing conventions that criminalize aircraft hijacking, nuclear theft, and other crimes that pose a threat to all, would make it an offense for any person, regardless of official position, to order, direct or knowingly render substantial assistance in the development, production, acquisition, or use of biological or chemical weapons. A person who commits any of the prohibited acts anywhere would face the risk of prosecution or of extradition, should that person be found in a state that supports the

proposed convention. International law that would hold individuals criminally responsible would create a new dimension of constraint against biological and chemical weapons. Such individuals would be regarded as *hostes humani generis* – enemies of all humanity. The norm against chemical and biological weapons would be strengthened; deterrence of potential offenders, both officials and unofficial, would be enhanced; and international cooperation in suppressing the prohibited activities would be facilitated.

What we see here – the non-use of biological weapons; the opprobrium in which they are generally held; the international treaties prohibiting their development, production, possession, and use; the initiation of mandatory declarations and on-site inspection under the CWC and negotiations to strengthen the BWC with similar measures; and the possibility of an international agreement to make biological and chemical weapons offenses international crimes, subject to universal jurisdiction and applicable even to leaders and heads of state – suggests that it may be possible to reverse the usual course of things and, in the century about to begin, avoid the hostile exploitation of biotechnology. Doing so will require wide understanding that the problem of biological weapons rises above the security interests of individual states and poses an unprecedented challenge to all.

Governor Thomas J. Ridge

First Assistant to the President for Homeland Security and became the first Secretary of the U.S. Department of Homeland Security. Also, former Governor of Pennsylvania. Currently, Chairman of Ridge Global and Co-Chair of the Blue Ribbon Study Panel on Biodefense*

Senator Lieberman and I were asked to co-chair the Blue Ribbon Study Panel on Biodefense, but one of the preconditions to accepting both the opportunity and the responsibility was that we did not just want to write one more “Washington Report.” We insisted that we also, upon the conclusion of the effort and the writing of the report, make very specific short and long term recommendations to the Congress of the United States – we felt that strongly about it. So I am grateful to be here with my friend Senator Lieberman, and we look forward to – both he and I, and the panel look forward to – working with the Potomac Institute as we take these recommendations and hopefully convince the Congress of the United States how serious it is.

I do not know how many of you figured that when you showed up today you would have this great briefing from General Vincent Stewart (Director of the Defense Intelligence Agency and the Commander, Joint Functional Component Command for Intelligence, Surveillance and Reconnaissance) about, perhaps, the kinetic threat of terrorism. And we all know there is a digital threat - we live in the digital world and in the physical world. But there is another world of concern that we addressed in the Panel and that is the world of bioterrorism. It is one of the lesser-discussed aspects of the terrorist threat, but after a year of inquiry, not just in Washington D.C., but around the United States, we concluded that the threat is real, it is growing, and frankly, given the nature of the threat, we do not think that the country is sufficiently prepared for it.

And one of the interesting challenges in trying to frame this for the body politic and for Congress, frankly, is that whether the threat, the pathogen, is thrown at you by Mother Nature or by a terrorist group, the impact and the consequences are the same. So, to a certain extent, it was a dual-use Panel. Whether you are dealing with the Zika virus or you are dealing with a bio attack from a terrorist, we are still not adequately prepared, regardless of the source of the attack. And Mother Nature reminds us regularly of the global need to combat contagious pathogens, regardless of the origin, regardless of the source.

Nature is already forcing us to deal with a great many infectious diseases. We all witnessed the events of the last two years as Ebola ravaged three countries in western Africa and crossed continents to reach Europe and the United States.

Shortly after I accepted the opportunity to work with President Bush as Assistant to the President for Homeland Security (this was in 2001), I was the recipient of a lot of briefings, and one of the briefings included the pathogens that we should be concerned about, that if they fell in the hands of the terrorists, we might have to deal with. Now this is 2001 and early 2002, and one of those pathogens was Ebola. You

* Presentation at an event on “International Cooperation in Combating Terrorism: Review of 2015 and Outlook for 2016” held on February 8, 2016, at the National Press Club.

draw your own conclusions – if we thought it serious enough then in 2001 and 2002 – whether as a country we had the infrastructure to identify and respond as quickly as we could in 2014 and 2015. So there has been an awareness out there for quite some time.

Think about in 2003, SARS began in China; zoonotic, based on the zoonotic episode. It took a while for the global community to become aware of it because it took a while for the authorities in China to let the World Health Organization know.

Avian influenza returned to our poultry facilities in the Midwest again this year.

And now we have the news about the Zika virus. Again, I think, the Administration deserves much congratulation, and it is admirable that the Administration has recognized the need and understands that resources are absolutely essential to deal with it, but once again, it is reflexive, a reaction, not pro-active. And one of the purposes of the panel, one of the purposes of the commission, is to build an infrastructure internally, both from a scientific and technical point of view, and a medical infrastructure point of view, so that when these things happen you may need emergency appropriations, but you do not have to scramble multiple agencies and multiple political appointees in order to bring specific focus on a potential pathogen.

I do not think we should forget, as well, the ever-present danger from pandemic influenza, the rise of antibiotic-resistant organisms (like Extremely Drug Resistant Tuberculosis), and let us also not forget about the spread of disease syndromes like SARS and MERS.

Meanwhile, the terrorist threat simmers quietly, but just as insidiously as ever before. The aspect of the bio-threat – the combination of intent and capability to use biological weapons – is pretty difficult to quantify. I think we all understand and agree on that. It is an enormous challenge to collect intelligence on the development of bio-weapons. How does our country or any country for that matter know whether someone working with pathogens in a laboratory is working for the benefit of that community and the world, or to its detriment? The dual-use problem is hard enough to tackle here in United States labs, much less in labs in makeshift facilities in foreign countries.

Now here are some of the open-source facts about this threat of which you may be aware, but it bears repeating. We know that al-Qa’ida sought to develop biological weapons. They launched a program in Afghanistan to develop anthrax into a mass-casualty weapon. The U.S. discovered evidence of that unsuccessful, or maybe just not fully realized, program after our military entered. We know that ISIL has publicly espoused the value of biological weapons for their ability to cause massive loss of life. And they have certainly expressed their intent to use such weapons. We know, according to the Intelligence Community and the Department of State, that China, Iran, North Korea, Russia, and Syria all continue to engage in suspicious dual-use or biological weapons-specific activities that we believe are in violation of the Biological and Toxin Weapons Convention.

We know that caches of incompletely destroyed or buried biological weapons materials from old state programs can now be accessed again and then smuggled to other regions for use in today’s wars by proxies, which include some of today’s

terrorists. And we know that ISIL now possesses what it needs to get a biological weapons program going: a large enough piece of land that can be both controlled and secured; physical infrastructure, like labs and manufacturing facilities; scientific expertise; and professional military personnel who would know how best to deploy these weapons.

So we believe, as part of the Panel's discussion and recommendation, we need to do a better job of getting the Intelligence Community (the IC) the resources it needs to address the biological threat properly. Frankly, given our assessment of the nature of the threat, we believe that the limited resources are far disproportionate (in a negative way) with regard to the emphasis we need to pay attention, and have the IC pay attention, to biological threats.

Now let me be very clear about something. Even with intelligence on nefarious intent, it takes obviously a very sufficient leap, perhaps, to go from intent to launching a successful attack. A significant amount of knowledge and the institution of some sort of program are necessary for the successful development and execution of a mass casualty attack with a biological weapon. These are fairly large hurdles to jump over, and may explain why we have not seen a large-scale biological attack yet. But our Study Panel, and, frankly, many of the experts who spoke with us and gave us some guidance actually are concerned that as biological science becomes democratized and increasingly ubiquitous, these hurdles become lower, and frankly they are going to be a lot easier to jump.

Still our weaknesses in bio-intelligence prevent us from having situational awareness of both our enemies' intent and their capabilities. We intend to work with Congress on the upcoming Intelligence Authorization Bill to realize the kind of improvements the nation needs in supporting IC.

Finally we also expressed a concern reflected in the testimony of many groups and individuals that appeared before us involving the interface between the digital world and the digital threat and the biological threat. Experts told us that the United States is not yet well positioned to address cyber threats that affect the biology and biotechnology sector. We do not know how a cyber attack would affect the life sciences and we are not sure how well pathogens' data are secured. Our Panel recommended that the U.S. government, in partnership clearly with the private sector, move quickly and innovatively to address this growing cybersecurity threat in this sector. We need a national strategy. We must be prepared to commit the resources to it for stored pathogen data. And we need to ensure that we provide the research community with standards, incentives, and support to secure its data as well.

Although we came up with about 33 recommendations and about a 100 very specific action items to help formalize the biodefense enterprise in this country and to make it to function more efficiently and effectively, there was one major, major recommendation – it may have been at the epicenter of our aspirations in terms of building a national strategy and response to the potential threat. Let me just say this as an outset: we identified over 50 political appointees who are given some narrow, important but narrow responsibilities in the whole area of biodefense. And you can well imagine the number of agencies that have as part of their jurisdiction

responsibility biodefense. So you have a multiplicity of people and agencies. Perhaps you can understand our most basic of recommendations.

Our foremost proposal was that the Vice President of the United States should be the focal point for coordinating the many responsibilities in hearing and running the loose conglomeration of activities and people we call within our government the biodefense enterprise. We need someone at the top who can get the multiple departments – there are a dozen-plus departments and agencies – working together, moving simultaneously in the same direction so we can make progress. For us, in many instances, it is a matter of leadership, organization, and implementation. All things we Americans are pretty good at, once we bring a focus to it, put somebody in charge to hold others accountable for the mission and to executing on the mission and the strategy that we proposed.

We also made several other recommendations to support the Vice President, including bringing members of both the government and the private sector together to actually build out a strategy upon which these recommendations would be implemented and execute that strategy, again in building the infrastructure we think we need to identify the threat, build the infrastructure internally, to respond and recover if, I do not want to be breathless about it, but in the event that either terrorists or Mother Nature throws a contagion at us, particular one that we are not well prepared for, if prepared at all.

Senator Joseph I. Lieberman

Former United States Senator and Attorney General of the State of Connecticut. Also, the Democratic Vice-Presidential candidate in 2000. Currently, Senior Counsel at Kasowitz, Benson, Torres, & Friedman LLP and Co-Chair of the Blue Ribbon Study Panel on Biodefense*

I just want to add a few points to what Governor Ridge said. He covered it – I mean this was about America’s state of preparedness to detect or prevent and respond to a bio threat, whether it be from terrorists or from nature. And it is hard to look at the current state of terrorism in the world, particularly with the coming of the Islamic State (which seems to have built its credibility and its sense of popularity in a small radical group because it went beyond the standards of brutality of even al-Qa’ida that preceded it, particularly with the beheadings). They are working now, as we knew al-Qa’ida was, to develop biological weapons to use against us.

The world presents every day, including this day with the announcement President Obama has made about responding to the Zika virus, the increasing threat of a naturally occurring pathogenic bio threat to the U.S and to people all over the world.

I just want to talk about a few of the conclusions. This is a program about international cooperation, most particularly about international cooperation in dealing with terrorism. But I do want to seize the moment and talk about international cooperation with regard to naturally occurring bio threats.

One of the things that I had known some about before from my work on homeland security - but really learned a lot more about on the Panel and also learned a new word, which I am embarrassed to say I did not know before – zoonotic. Zoonotic means diseases that reach human beings through animals. We learned a lot about that subject, particularly about what I would call the generally prevalent and totally artificial separation between humans, animals, and the environment, when it comes to biological threats. In fact, among the biological threats for which the U.S Department of Homeland Security has issued a Material Threat Determination, all of them except smallpox are zoonotic. The same is true of emerging infectious diseases, 60 percent of which enter the human population via animals. I saw an article a while ago that started with a question, “What is the animal or non-human being that has the deadliest effect on the human race?” And you can make a lot of guesses, maybe today because of Zika you will guess what it is. It is the mosquito. This study that I saw said the mosquito can be blamed for 750,000 deaths a year around the globe.

Tom Ridge talked about avian influenza, which devastated parts of the poultry industry in our own Midwest, Northwest, and California last year. More than 48 million birds had to be culled and euthanized. That doubled the price of eggs, cost taxpayers nearly \$1 billion, and reminded us that there were no vaccines or treatments available to prevent the spread of the disease or treat the poultry that had it. But what actually is alarming is how these diseases spread. Avian influenza began in Asia and was carried by migratory waterfowl, which then (in various ways) enabled it to spread to poultry. How it got to the United States, or to North America, and to

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South America are fascinating questions. Some of the theories, believe it or not, are that the migratory birds meet in the Arctic and sometimes the Antarctic and then blend and spread the disease and bring it back to where they were.

This cries out for international cooperation because while it is true that individual countries can limit the spread of disease by applying public health standards in their immigration policies – that is to, at least temporarily, perhaps permanently, stop people from coming in who show signs of the disease – ultimately that is not going to work. Ultimately, no matter what your overall immigration policy is or if you put up a big wall to stop immigrants from coming in, it is not going to stop the waterfowl or the mosquitoes which are carrying the disease – and that really calls on us all to figure out how to cooperate to cut the incidence of these diseases.

I saw a statement by an expert in this field a while ago that predicted that sometime in the next two or three decades there would, in fact – unless we managed to come up with better prevention devices and approaches and better major medical countermeasures, that at some point there would – be an infectious disease pandemic. It would make as many as a billion people sick, would kill millions of people, and would cost the world over a trillion dollars, maybe trillions of dollars. So we need international cooperation to work to prevent that, of course, from ever happening.

Let me just focus quickly on two international organizations that the U.S. and a lot of the countries represented here are a part of. One is the Biological and Toxin Weapons Convention, the so called BWC, which has presented a lot of challenge to all of its signatories. Given the dual-use nature of much of the work done in the life sciences, it is difficult to verify that countries are not doing that work in support of an active biological weapons program as opposed to a more benign and constructive activity, including dealing with the threats that I have just described of naturally occurring infectious diseases. You have got to recognize, as our Panel did, the difficulties inherent in establishing effective verification protocols, and America's representatives to the BWC have expressed that clearly. But, just because verification is hard does not mean that we can in any sense disengage from this international process. We have got to keep trying to establish a verification protocol that makes sense and enables all nations of the world to differentiate between legitimate work and that used or being used to develop biological weapons. And that from our point of view means that the United States must stay at the table, engaged with the rest of the world, to make progress on this problem.

The second organization is obviously the World Health Organization which has worked hard to maintain awareness of what I called global disease pathogenic surveillance (in other words, which diseases are where) and to alert the world when serious diseases appear and spread. But WHO does not have the resources or capabilities to do it all. We have a responsibility, our Panel concluded, to lend our resources and expertise to the global disease surveillance endeavor. I understand the United States has, I know the U.S has, contributed in the past, for instance sending CDC personnel to work at WHO headquarters in Geneva, donating funds to the global outbreak alert and response network, and sharing a lot of the information that we get from our own disease surveillance efforts. I also know that the Obama Administration, fortunately, has placed a high priority on global health security. We have got to

maintain and increase those efforts in our own self-interest and self-defense, let alone to protect the rest of the world.

Governor Ridge talked about 33 recommendations and 100 action items of our report. We do not have time to even begin to describe those, but it is online. I urge you to go to that report. I do want to say (on a day when President Obama – and I thank President Obama for announcing the \$1.8 billion to take preventive and responsive action to the Zika Virus – on a day when he announced that) that the finding of our Panel was that the federal government is simply not coordinating the enormous number of efforts in this area of detection and response to bio threats. Therefore, while I am grateful for the statement the President has made, I am also concerned about whether this money will be used in a well-coordinated and most cost-effective way for our government. And that is why, as Tom said, we recommended something unusual, which is that the Office of the Vice President be put in charge of this to give it the power and clout of the White House and also to be able to coordinate what is going on.

Bottom line: bio terrorism and naturally occurring infectious diseases are a clear and present danger in our time, a danger that is growing. We concluded that our response to that threat is not growing as fast as the threat itself. We need to pick up the pace and, to go to the topic of today, we will do it best if the nations of the world are working together to meet this challenge, to help all of our citizens.

Professor Rita Colwell

Distinguished University Professor at the University of Maryland, College Park and the Johns Hopkins University Bloomberg School of Public Health, and Senior Fellow at Potomac Institute for Policy Studies*

This presentation is very direct and concerns a molecular biology story that began shortly after 9/11, while I served as Director of the National Science Foundation. What is less vividly remembered of that period in time is the anthrax event that followed the destruction of the towers of the World Trade Center and the plane crash into the Pentagon. Late in the fall of 2001, a reporter died in Florida. The details of his death were eventually published in the newspapers but there was a delay before it was determined that he died from an anthrax infection. Much misinformation was disseminated, including the conjecture that the reporter contracted anthrax from water he drank while hiking on his trip to Florida. As a nation, we were naïve, having had little information about anthrax in the public domain. Subsequently, additional cases of anthrax appeared following the reporter's demise. Most of these new cases were in Washington, DC, and were Post Office workers at the postal station serving the federal government. Unbeknownst to the perpetrator, powder in envelopes stamped by postal machines seeps through pores of envelopes. Several postal workers died of inhalation anthrax, others became ill, and remain disabled from the anthrax infection even today. These events occurred essentially on the heels of the New York and Washington incidents, involved closing buildings and subjecting workers to preventative medical treatment, and was terrifying for the nation.

The immediate assumption was that al-Qa'ida or a foreign national was the perpetrator. Today I can speak about this terrorist event as the report has been declassified and it is important to speak out. The story needs to be told because this act of bioterrorism was disastrous. Norman Kahn, present at today's March 23, 2017 workshop, was at the CIA at the time and led that agency's anthrax team. Norm and I worked together to form an interagency committee, of which I served as chairman, the "National Interagency Genome Sciences Coordinating Committee". We did not have a formal appointment and the committee easily could have had official authorization, but that would have required formalities. We comprised an informal interagency research group, meeting every Friday afternoon in a Sensitive Compartmented Information Facility (SCIF). CIA, Department of Justice, FBI, Department of Homeland Security, National Science Foundation, National Institutes of Health, and approximately a dozen other agencies had representatives at this informal gathering. There were about 20 of us who met every Friday afternoon, as a "research group" for three years, and continued to meet every month for another three years.

It took that long to track down the source of the anthrax and the task was accomplished using molecular biology as a tool. It was the launch of bioforensics. Every strain of *Bacillus anthracis* that could be traced to the specific anthrax strain that had been isolated from the Florida victim was collected and analyzed.

Sequencing of all isolates obtained was done and the DNA sequences were matched. It was then possible to show that the flask containing *B. anthracis* at Fort

* Presentation at an event on "Preventing WMD Terrorism: Past Lessons and Future Outlook" held on March 23, 2017, at the Potomac Institute for Policy Studies.

Detrick was a source. That culture was a test strain for vaccine being developed against anthrax at Fort Detrick. The flask contained a composite of cultures grown in different laboratories and composited as a test for the vaccine. Since the composite was a mixture of cultures, mutations had occurred independently during growth and harvest. It was possible, then, to show that those mutations were present in the criminal case samples, e.g., those anthrax cultures sent as powders in envelopes to Senators Daschle and Leahy and to the media. The six years that it took to track down the source represented an arduous, tedious but ultimately successful process.

In that year following 9/11, the country suffered through the horrors of destruction and death in New York City, not knowing when there might again be another anthrax event. The death of the reporter in Florida was followed by mailing of envelopes with anthrax powder to members of Congress. And then the death of a woman in an entirely different location, tracked to a post office box, where letters with anthrax powder had been dropped.

An important point to keep in mind is that to cause that kind of social upheaval as this anthrax perpetrator succeeded in accomplishing did not require an elaborate laboratory facility, and neither enormous sums of money, nor cadres of personnel. All that is required is a warped minded individual with the technical knowledge of a clever undergraduate or graduate student able to grow *Bacillus anthracis* and introduce it in a relatively simple way to cause the most harm. The threat of the unknown explodes the overall effect in the public mind and the country can then be forced to a standstill. For example, before 9/11 there was an event that took place at the B'nai B'rith in Washington, D.C. Petri dishes were left at the entrance with a note, "Beware of anthrax." It turned out to be a hoax but that scenario closed down Washington, D.C. for a day, demonstrating the social upheaval a biological event can cause.

Since 2008, my team and many others have been working to develop the capacity to identify pathogens rapidly, accurately, and actionably, to ensure that rapid detection and identification can be achieved within minutes or hours so that action can be taken and lives saved. Using methods that have been developed over the past decade, any sample of water, soil, or clinical specimen, such as urine and blood, or food or water can be extracted to obtain their nucleic acid content. The extracted DNA and RNA can now be sequenced relatively inexpensively and accomplished within hours, not days or weeks. The raw sequences obtained from a sequencing machine are matched against libraries that have been constructed, with matching done at very high speed using probabilistic Bayesian/statistics approaches. Microorganisms (bacteria, viruses, fungi, and parasites) can now be identified to species and strains and then genes that code for antibiotic resistance, virulence, and metabolic properties are characterized. The entire set of analyses can now be accomplished within minutes after the sequencing is done. Thus, in the years since the anthrax event, science has moved rapidly to provide technical capacity to address bioterrorism events as occurred in late fall of 2001.

One example of success is a study we have done with a team at the National Institute for Cholera and Enteric Diseases. A number of samples were collected, including healthy volunteers and hospital patients diagnosed as having cholera, including samples from patients whose disease agent could not be identified using

standard culturing methods. The gut flora of these volunteers was determined and NIH human microbiome data served as reference.

Summation of the gut flora of all patients, based on DNA sequencing, allowed identification of the pathogens causing the disease. It was discovered that more than one pathogen was present in patient specimens. Thus, we discovered that enteric infections are caused by a mixture of pathogens and not a single pathogen, with three or four, up to ten pathogens are involved in infections previously concluded to be cholera. This stunning finding was confirmed by our colleagues in India who used standard bacteriological culture methods that took weeks to accomplish. Our findings were obtained in minutes.

Another very interesting finding was that the Western gut flora differs significantly from the Indian gut flora, creating a new bioforensics tool. A parallel finding was that the Indian and Western gut flora differ in the incidence of antibiotic resistance genes, very likely a result that antibiotics are freely available without prescription in India.

This experience is a very simple and brief example of the power of molecular biology as a forensic tool. We now have the tools to mount a powerful defense against biotreats, but we must consider how to build this capacity to protect our country against future bioterrorism attacks.

The Honorable Tevi Troy, PhD

CEO, American Health Policy Institute. Former Deputy Secretary, U.S. Department of Health and Human Services. Author, *Shall We Wake the President? Two Centuries of Disaster Management from the Oval Office**

As we were talking earlier about the terror attack in England, I would say we have become used to conventional terror. I am not happy about it, but we have kind of figured out a process. Something happens, people scream about it in the media, law enforcement steps in; other than the people directly affected, people clean up the roads and move on.

If there were to be a bioterror attack, which is what I am going to be talking about, such an attack would be so much worse. We have seen some speculation about what would happen in such a case. There is the Dark Winter exercise of a smallpox simulation that said we would have one million dead and only vaccine enough for five percent of the population. There was a National Security Council analysis in 2009 that said an anthrax attack would kill in the hundreds of thousands and cost over a trillion dollars.

We also know that a bio attack is doable. It is something that can be done, in large part by someone with a graduate degree, but Rita Colwell scared me a little bit by saying someone with an undergraduate degree could do it as well. It is not necessarily easy, I would say. Rita said one problem is that most of us are not biologists, and that is true. I am also not a biologist, and I certainly could not do it.

But there are some problems for the bad guys in making it happen. For example, there was an ISIS laptop recovered that said they were trying to weaponize plague. My understanding is that plague today could probably be treated with antibiotics and it would not be as big a problem as it was in the Middle Ages. That said, the fact that ISIS is thinking about how to weaponize various pathogens is worrisome.

Another thing that worries me is the fact that if you look at the incidents of bioterror or attempted bioterror in this country. I can think of a couple. In World War I, German agents tried to infect horses that would be used by our military back then with glanders. There was the Dalles, Oregon, incident in the 1980s where a cult poisoned salad bars with salmonella for a very weird reason: the Bhagwan Shree Rajneesh cult was trying to win an election and have enough people sick and out of action that they could win this election. And then obviously, you have the anthrax mailings in 2001 that killed five people.

Now in none of those did we immediately detect what was happening. In none of them did our law enforcement actually catch the perpetrator. Rita talked about how her team eventually identified the 2001 anthrax perpetrator, but I believe he committed suicide before he was caught or arrested. In the glanders thing, historians have written about it, but the perpetrators were not caught at the time. And in Dalles, Oregon, the only way they knew that it was the Bhagwan Shree Rajneesh doing this

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was they admitted they were doing it, which seems like a silly approach to a criminal enterprise but nevertheless that is what happened.

So finding out either in advance or even after the fact is a real worry and a real concern. I have recently been working on a project on what would happen if we were to have a bioterror attack in New York City. If you look at the terror attacks over the course of our recent history, the most likely locations for a terror attack are military installations, New York City, or Washington. These are the most likely places. And New York is a very inviting target from a symbolic and also a financial perspective. But it is also a hard target to defend. New York has 240 skyscrapers. Next closest city in the U.S. is Chicago, with about 100. So New York has two and half times as many skyscrapers as the next closest city. And each one of those I would say is very inviting for a potential bioterrorist. If you can get into the ventilation system and put the pathogen there, then you have potentially thousands of people being infected. Remember the initial thoughts on the World Trade Center were that 50,000 people were working in those buildings and could have been affected. It was of course terribly tragic what happened, but fortunately the vast majority of people did get out.

Because dispersal is one of the key issues when it comes to bioterrorists, one has to figure out not just how to produce something that is virulent and dangerous, but how to disperse it among the population. That is why a city is also a more vulnerable target than a wide-open area.

So the good news on this front is that New York City has spent a lot of time thinking about this. It has done planning and operations not just for bioterror incidents but also for naturally occurring diseases. For example, in 2009, for H1N1 New York vaccinated 250,000 people within a very short window. It also has its own intelligence unit, not necessarily for good reasons, and there is a fascinating book that talks about this¹⁵. The reason New York City developed its own intel unit is because it felt that the FBI and CIA were not sharing information with the police. There was one time, it is a great story, after the bombings in Spain that killed almost 200 people, that the New York City Police Department received a comprehensive report on it from the CIA. It wrote back to the CIA that this really excellent and fantastic work, it really tells everything we needed to know, too bad it came to us a year late. So the fact is that New York City has felt the need and necessity to develop its own intelligence capabilities.

So NYC has prepared detection systems within the city. At the same time, New York City is five boroughs, it is a huge area, enormous population, 300 square miles, 62 hospitals where they speak over 150 languages. So there are a lot of challenges in dealing with New York.

From a federal perspective, our strategy is based on the deployment of the Strategic National Stockpile. We have countermeasures that are stored and we can theoretically get them anywhere within the country in about 24 hours, which is great, but there are two problems with that. Number one is distribution within a local area. You get the countermeasures, vaccines or antivirals to an area in a very short amount of time from these 12 Strategic National Stockpile locations, but to distribute them to all eight

¹⁵ Cf. Christopher Dickey, [Securing the City](#).

million people in New York City, for example, is its own logistical challenge. This is something that feds do not normally help with so it is usually left to the locals. The second thing is that the two most worrisome pathogens that we have seen in recent years – not bioterror but both worrisome – were Ebola and Zika. And for neither of them did the Strategic National Stockpile have a countermeasure ready. There were not antivirals or vaccines for either of these events that took place in 2014 and 2016. So you can spend seven billion dollars on a Strategic National Stockpile – which we have – and 500 million dollars annually maintaining it – which we do. But you may not have the right countermeasures for the right pathogen at the right time, and that is worrisome. I think overall, we do a good job in selecting what goes in there, but with nefarious minds at work, they will try to subvert our best efforts. In fact, we do not publicize all the things we have in the Strategic National Stockpile, so terrorists cannot necessarily figure it out. But still, they can make guesses just as we make guesses about what they are trying to do.

So I have been looking into this because I have written a recent book that Yonah has mentioned: *Shall We Wake the President? Two Centuries of Disaster Management from the Oval Office*. It looks at how presidents have dealt with a variety of disasters, both natural and manmade. I do have a chapter in there on bioterror, and the overall takeaway from the book is that over the last two centuries we have gotten the presidents more and more involved in disaster response. Two hundred years ago it was not even an issue, we did not think about presidents getting involved in disasters, in part because of communications, but also because of the Constitution. In 1811, there was a massive earthquake in Missouri regarding which President Madison did not even know about the extent of the damages for six weeks. What was he going to do, send a wagon train six weeks later and in three months end up in Missouri and say, “Hey, proto FEMA is here.”? It just was not realistic.

Over time, we did start to develop more immediate communications, but even in the 19th century when we had telegraph, presidents did not think that it was their role to get involved in these kinds of things. President Harrison gets a telegraphic message in 1889 about the Johnstown flood, in which 2000 Americans die. He sends them back a telegraphic saying it is not his area of responsibility, it is up to the governor and you should go to the governor with your requests. Johnstown telegraphed back to President Harrison and they say, this is a quote “We thank you.” They thanked him for his response. So again, not the way we look at it today.

But over the course of the 20th century for a variety of reasons, and if you are interested in those reasons you can get the book, the president has gotten more and more involved and now there is an expectation that the president gets involved with almost every sort of disaster. My argument in the book is that today we have the president overly involved, and the top levels of the federal government are overly involved with too many types of disasters, particularly weather-based disasters.

And what I argue is not that the president should step out and say “I have nothing to do with disasters,” because presidents are important in terms of galvanizing federal responses and showing compassion and leadership, and making sure federal resources are directed appropriately. It is not that the president should get out, it is that the president should rebalance the effort. So that the president does look at this issue of bioterror and preparing for bioterror, because let us face it, the state of Idaho

cannot really prepare its own strategic national stockpile. And even though New York has its own intelligence unit in its police department, it is not a realistic expectation to expect every state and locality to have its own intelligence units to prevent bioterror attacks. So this is a good area and an appropriate area for presidential involvement. But at the same time, given the demands on presidential time and presidential focus, I think that we should rebalance away from some other types of disasters that are not necessarily the best use of the president's time. Especially as we are going into a new administration, I think this new administration and all new administrations should think about how they approach these issues so we are better protected for bioterror and other types of threats we face.

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